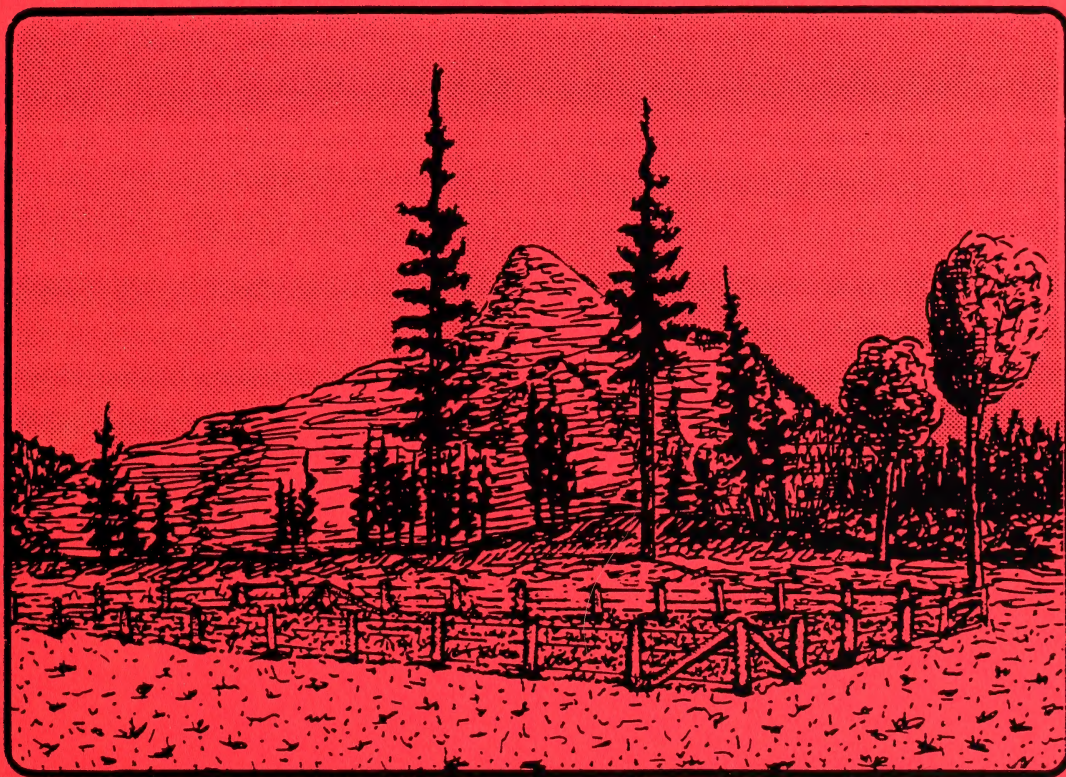


OCT 23 1997

# RANGELAND REFERENCE AREAS

## CHIMNEY ROCK SOUTH RANGE CONDITION AND TREND FROM 1973-1995



**Alberta**

ENVIRONMENTAL PROTECTION





**RANGELAND REFERENCE AREAS**

**CHIMNEY ROCK SOUTH**

**RANGE CONDITION AND TREND FROM 1973-1995**

**prepared by**

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1997

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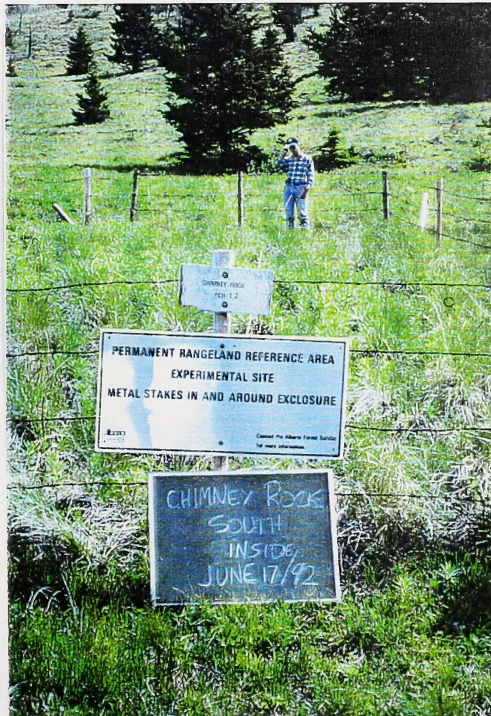
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**Photo 1.** Overview of the Chimney Rock South Rangeland Reference Area.



**Photo 2.** The inside ungrazed transect is dominated by rough fescue and fireweed and has a lower species diversity than the outside grazed transect.



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## ABSTRACT

The Rangeland Reference Area program administered by the Land and Forest Service was established by the Eastern Rockies Forest Conservation Board to assess range condition and monitor trend on rangelands within the boundaries of the Rocky Mountain Forest Reserve (RMFR). Forty-five fenced exclosures have been established in the Forest Reserve. These exclosures include permanently marked grazed and ungrazed transects. Species composition data has been recorded on these transects since 1953 when many of the sites were established. Recently, the data of these sites has been analyzed in order to determine the successional pathways in the presence and absence of grazing. This long-term data used in conjunction with a detailed ecological classification of the range community types will help to determine the health of the forested rangelands in the province.

This report evaluates and discusses the range condition and trend of the Chimney Rock South Rangeland Reference Area. This reference area was established in Distribution Unit #3 of the Chimney Rock Allotment in 1973. It is located within the Montane subregion and is part of the group of community types represented by the rough fescue ecosite (Willoughby et al. 1997).





## INTRODUCTION

In the late 1800's livestock grazing was unregulated along the eastern slopes of the Rocky Mountains in Alberta. In an effort to protect the Saskatchewan River basin watershed the Rocky Mountain Forest Reserve was established in 1910. At this time grazing by domestic animals was prohibited. However, by 1913 grazing by livestock was recognized as a useful tool to reduce forage accumulation and assist in preventing a potential fire hazard. Due to inadequate management policies and funding, water quality continued to deteriorate because of fire and localized overgrazing. As a result, the Rangeland Reference Area Program of the Alberta Forest Service was established in 1949 to assess range condition and monitor range trend on grasslands within the boundaries of the Rocky Mountain Forest Reserve (Hanson 1975). Forty-five reference areas have been established in the Reserve. Many of these sites have been monitored since 1953.

This report discusses and evaluates the range condition and trend of the Chimney Rock South Rangeland Reference Area. The reference area was established in 1973, on a southwest facing slope (25%). The area surrounding the site was recognized as geologically unique and there was concern that over-utilization by livestock could severely affect the condition of the grasslands.

## SITE DESCRIPTION

The Chimney Rock South Reference Area is part of the primary rangelands in the Montane subregion of Alberta (Dept. of Environmental Protection 1994). The Montane subregion encompasses only 0.9% of the province and is found in an area south of Chain Lakes to the Montana border, portions of the Bow and Athabasca river valleys and isolated areas near Ya Ha Tinda and Grande Cache. The Montane is distinguished from the other subregions by the presence of Douglas fir (*Pseudotsuga menziesii*), limber pine (*Pinus flexilis*) and lodgepole pine (*Pinus contorta*). Elevationally the Montane occurs below the Subalpine in the mountains and above the Foothills Fescue and Foothills Parkland subregions in southern Alberta.

Yearly precipitation ranges 308 mm to 1279 mm with two precipitation peaks occurring in May-June and again in August-September (Strong 1992). Summer monthly temperatures average 11.9°C and are 2°C warmer than the Subalpine and 2°C colder than the Foothills Fescue subregions. The Montane has the warmest winter temperatures of any forested subregion in Alberta. This is due to the montane's association with the major east-west mountain valleys. The valleys are warm during winter as they channel warm modified Pacific air into Alberta and often escape outbreaks of cold arctic air from the north (Strong 1992).

In the Montane the modal grassland vegetation occurs on terraces and southerly facing slopes. The dominant grass species include rough fescue (*Festuca scabrella*), Parry oatgrass (*Danthonia parryi*), Richardson needlegrass (*Stipa richardsonii*), Idaho fescue (*Festuca idahoensis*), upland sedge species and bluebunch wheatgrass (*Agropyron spicatum*). Moss and Campbell (1947) believed the rich flora of this subregion could be explained in terms of the continuity with the Palouse prairie through mountain passes from the Northwestern United States. Many species characteristic of the Palouse prairie are found in southwestern Alberta: Idaho



fescue, bluebunch wheatgrass, sticky purple geranium (*Geranium viscosissimum*), woolly gromwell (*Lithospermum ruderae*), and balsamroot (*Balsamorhiza sagittata*). The Chimney Rock South rangeland reference area represents a rough fescue-dominated community type on a colluvial blanket over ridged bedrock, with a Orthic Black Chernozemic soil (Weerstra 1989). The inside ungrazed and outside grazed transects were classified as a Rough fescue-Idaho fescue-Parry oatgrass community type for the Montane subregion (Willoughby et al. 1997).

## METHODS

Reference sites were selected from within range allotments on areas that represented primary range. Originally sites thought to be in poor range condition were selected. These sites were usually represented by open grasslands on south-facing slopes, benchlands and terraces. The reference sites were not located near salt or within 100-ft. (30-m) of a fence. The preferred distance from a water source was greater than 1000-ft. (300-m) but less than 1-mi. (1.6-km).

Each reference site consisted of a fenced exclosure and a 100-ft (33-m) transect inside and outside the exclosure. The outside transect was situated 25-ft (8-m) or greater from the edge of the exclosure. At 3-in. (7-cm) intervals, the basal frequency of the plant species were recorded using Parker's loop (Parker 1954). In 1982, the canopy cover of the plant species was also recorded (at 6-ft. (1.8-m) intervals) using a 20x50 cm Daubenmire frame. Presently, the transects are being recorded every three years. All the basal frequency data prior to 1982 was converted to canopy cover using regression analysis. The regression equation for the Chimney Rock South reference area is  $(COVER)=1.45+0.79(FREQ)$ ,  $R^2=.39$ ,  $p>.0001$ .

The reference area is located in distribution unit #3 (D.U.3) of the Chimney Rock allotment.

A combination of both ordination (DECORANA) (Gauch 1982) and cluster analysis (SAS) were used to group the inside and outside transects of different years. These techniques combined the sites based on the similarity of species composition. The groupings from cluster analysis were overlain on the site ordination. The number refers to the year the transect was recorded, the (i) refers to inside (ungrazed) transect, the (o) to the outside (grazed) transect.

Mean grazing pressure for each year was assessed by comparing annual utilization to the rated carrying capacity of the lease. Total yearly AUM (Animal Unit Months) useage from the inception of the lease was divided by the calculated carrying capacity (AUM) and multiplied by 100. For example a number of 100 would indicate proper utilization.

Species diversity was assessed using the Shannon-Wiener index of diversity (Krebs 1978).

## RESULTS

### Historic precipitation

Total yearly precipitation and the 30 year average for Beaver mines Meterological station, is outlined in Figure 1. The 1940's, 50's and 60's had precipitation levels near normal. Only 3-4 years in each decade had precipitation levels below the 30 year average of 645 mm. In contrast





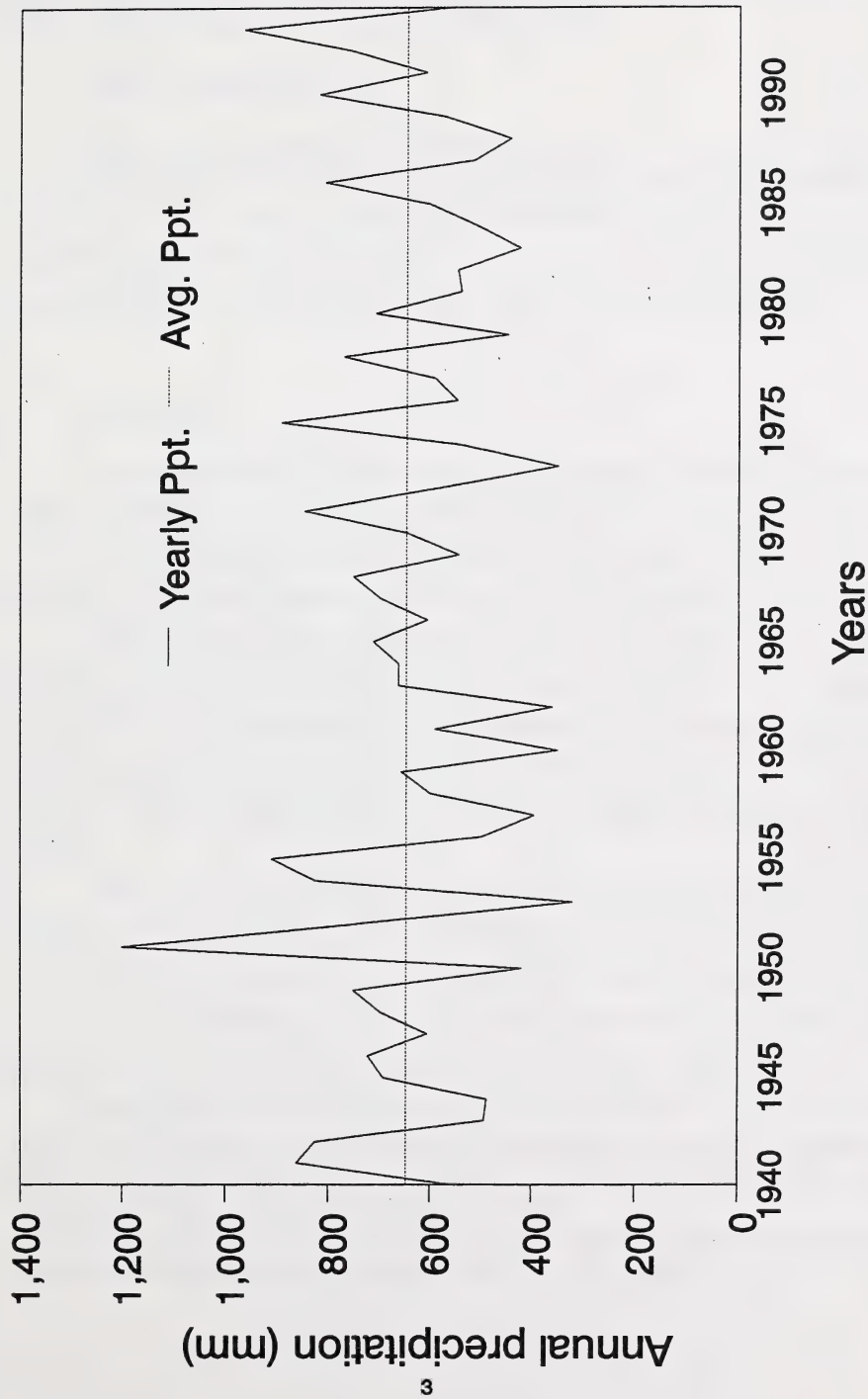


Figure 1. Total yearly precipitation and 30 year average for Beaver Mines Meteorological Station. Source. Canada, Department of the Environment, Monthly Meteorological Records.





the 1970's had 6 years with below average precipitation and the 1980's was the driest decade on record for the Beaver mines station. Eight of the ten years had below normal precipitation and the average for the whole decade was 567 mm. To date precipitation has been well above normal for the 1990's averaging well over 700mm for each year.

### **Historic grazing pressure**

Range use on the Chimney Rock allotment and D.U. #3 was above the calculated carrying capacity from 1947 to 1962 averaging over 121% of calculated carrying capacity (Figure 2). From 1962 to 1973 when the exclosure was established use in D.U. #3 averaged 114% of calculated carrying capacity. Since 1973 use has been light to moderate averaging 103% in the 1970's and 1980's to 106% in the 1990's. The distribution unit is utilized by yearlings and has generally been grazed from mid-July to the end of September (Appendix 2).

### **Vegetation**

The ordination of the Chimney Rock South Rangeland Reference Area is outlined in Figure 3. The first two axes in the ordination accounted for 32% and 15% of the variation in the species stand table, respectively. There is a distinct grouping of the outside transects from 1973 to 1995 (Group 1) and the inside transects from 1979 to 1995 (Group 2). The inside transect in 1973 was very similar to the outside transect in 1973 and therefore was lumped into group 1.

The inside and outside transects from 1973 to 1995 (Groups 1 and 2) represent plant communities that were dominated by Parry oatgrass, rough fescue, sedge, strawberry, yellow beardtongue, old man's whiskers and fireweed (Table 1). There was no significant difference between cover of the dominant grass species between the two groups. However, a number of forb species had significantly different covers between the two groups. Fireweed cover was greater in group 2 than group 1, whereas, old man's whiskers and strawberry cover were greater in group 1. Yearly, species diversity was also significantly greater in Group 1 than Group 2 (Table 1).

Table 2 outlines the change in canopy cover of the dominant species on the inside and outside transects from 1973 to 1995. When the site was first protected in 1973 both the inside and outside transects were dominated by Parry oatgrass and sedge. Six years after protection from grazing (1979) rough fescue cover had increased and there was a decline in Parry oatgrass, sedge and forb cover. Through the 1980's and 90's rough fescue continued to dominate the inside ungrazed transect with corresponding low cover values for the other grass and forb species. Since 1986 fireweed cover has increased dramatically on the ungrazed transect.

Rough fescue cover also increased in cover from 1973 to 1979 on the grazed outside transect, but the cover of the other grass and forb species has remained constant to form a Rough fescue-Parry oatgrass-dominated community type. This trend in species composition of the outside grazed transect has continued up until 1995.

Species richness and diversity continues to be greater on the outside grazed transect when compared to the inside ungrazed transect for each year (Table 2).



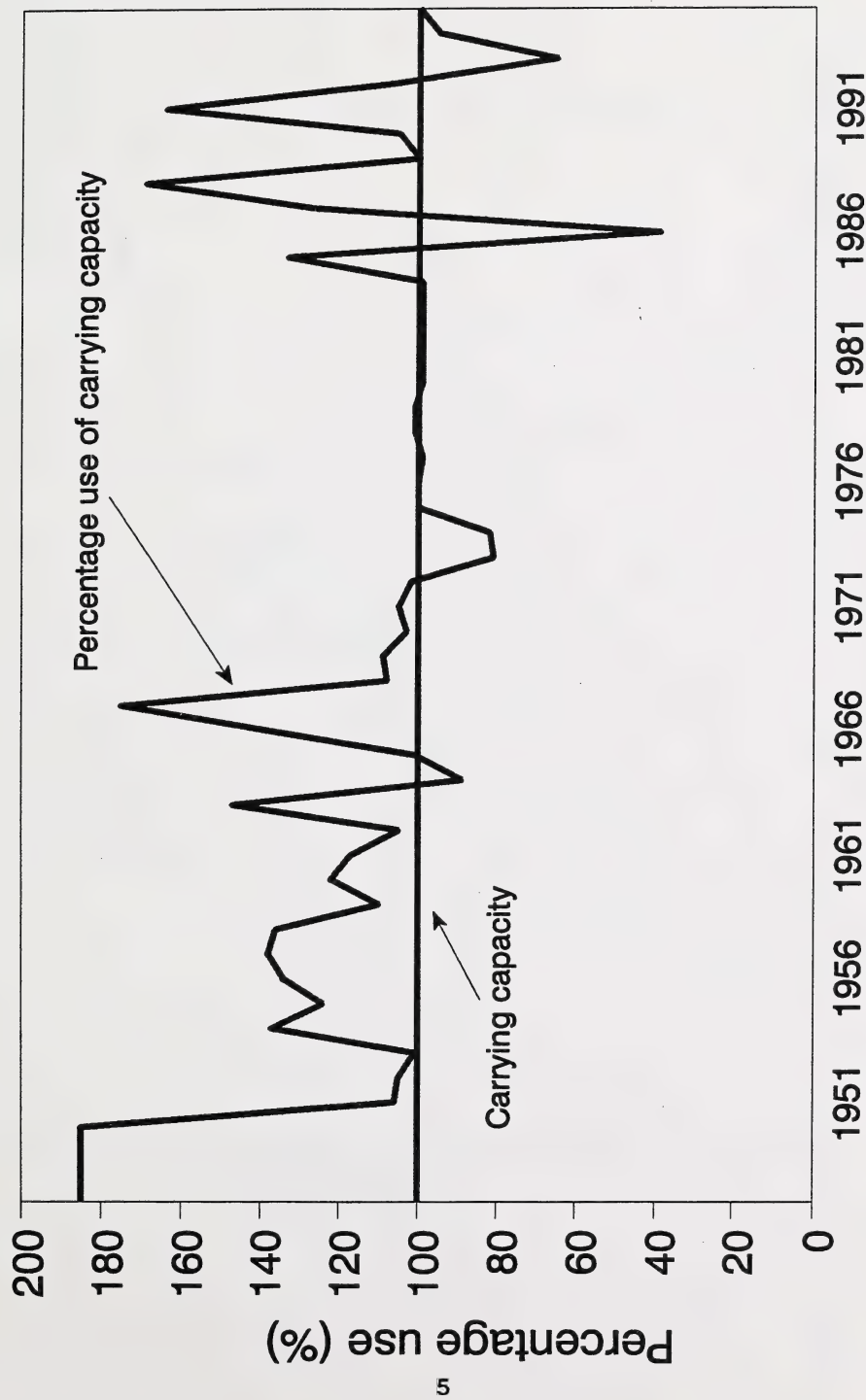


Figure 2. Percentage use of calculated carrying capacity for the Chimney Rock allotment-Field #3 distribution unit (D.U.).





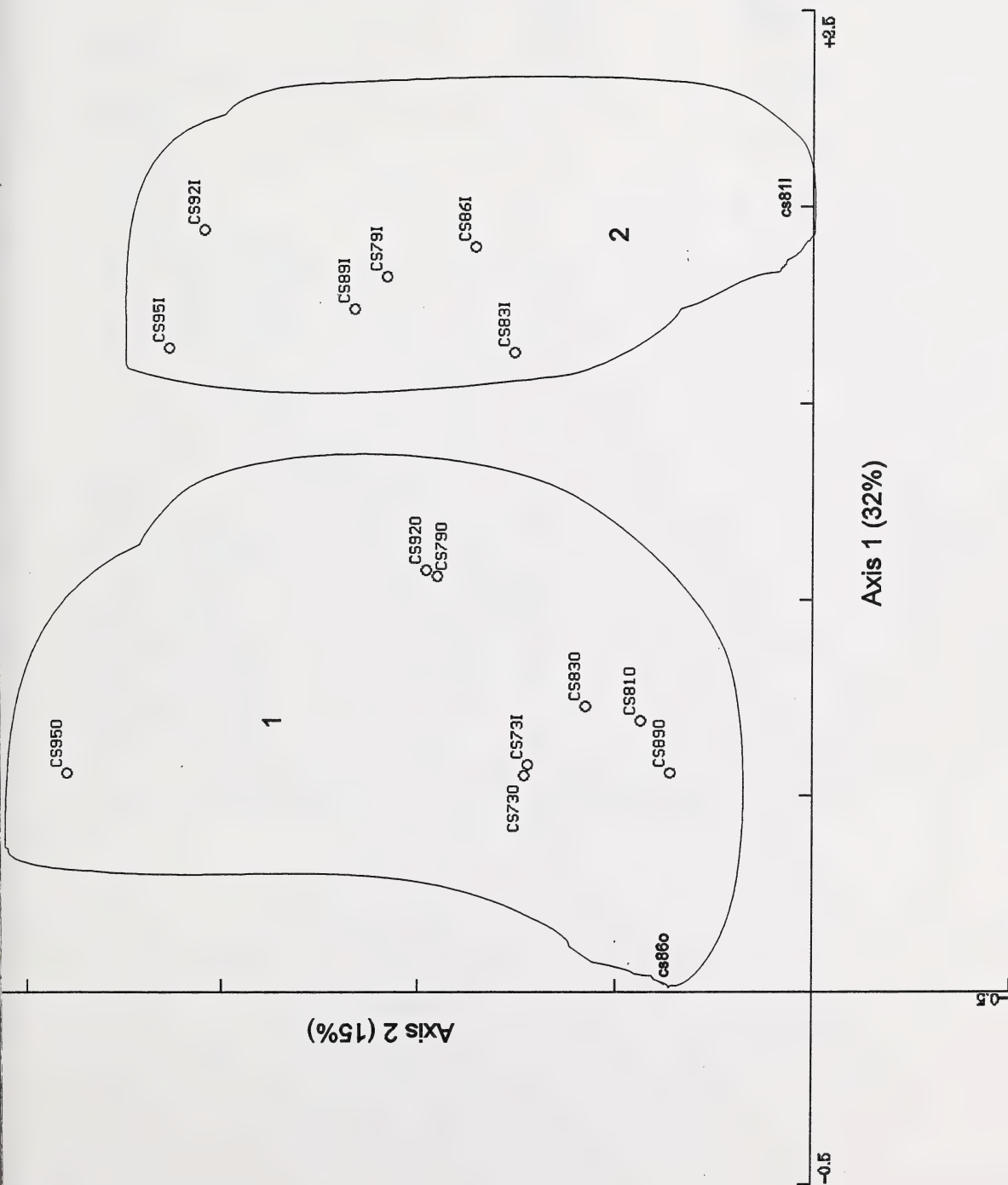


Figure 3. Ordination of the Chimney Rock South Rangeland Reference Area (I=Inside, O=Outside)



Table 1. Canopy cover (%) of the dominant species for Groups 1 and 2 as outlined in Figure 3 at the South Chimney Rock Rangeland Reference area.

Species	Out(1) 1973-95 1973 In	In(2) 1979-95
<b>Shrubs</b>		
ROSE SPP. ( <i>Rosa spp.</i> )	1A	5A
<b>Forbs</b>		
STRAWBERRY ( <i>Fragaria virginiana</i> )	9A	1B
YELLOW BEARDTONGUE ( <i>Penstemon procerus</i> )	8A	5A
OLD MAN'S WHISKERS ( <i>Geum triflorum</i> )	4A	TB
YARROW ( <i>Achillea millefolium</i> )	3A	2A
FIREWEED ( <i>Epilobium angustifolium</i> )	1B	11A
<b>Grasses</b>		
IDAHO FESCUE ( <i>Festuca idhahoensis</i> )	2A	3A
BLUNT SEDGE ( <i>Carex obtusata</i> )	7A	9A
ROUGH FESCUE ( <i>Festuca scabrella</i> )	14A	25A
PARRY OATGRASS ( <i>Danthonia parryi</i> )	12A	5A
SPECIES DIVERSITY	2.5A	2.1B

\*Means with different letters indicate a significant difference at the p= 0.05 level.





Table 2. Change in canopy cover (%) of selected species on the grazed (Out) and ungrazed (In) transects from 1973 to 1995 at the South Chimney Rock rangeland reference area.

Species	In					Out				
	1973	1979	1986	1992	1995	1973	1979	1986	1992	1995
<b>Shrubs</b>										
ROSE SPP.	-	-	8	2	2	-	-	1	T	1
<b>Forbs</b>										
STRAWBERRY	5	-	-	-	-	1	3	10	12	8
YELLOW BEARDTONGUE	2	-	3	8	2	2	3	1	10	8
FIREWEED	-	-	8	23	8	-	-	-	3	1
OLD MAN'S WHISKERS	2	-	-	-	-	4	-	5	6	5
YARROW	2	-	3	1	T	2	3	2	2	4
<b>Grasses</b>										
ROUGH FESCUE	5	21	11	56	15	3	16	4	39	14
PARRY OATGRASS	17	3	6	1	2	16	12	6	11	9
BLUNT SEDGE	11	-	2	9	12	12	-	1	2	14
IDAHO FESCUE	3	2	1	4	4	-	-	T	6	6
<b>Species number</b>	16	13	17	14	30	14	10	24	22	31
<b>Species diversity</b>	2.3	2.1	2.1	1.7	2.4	2.5	2.0	2.7	2.4	2.8



## DISCUSSION

### Plant community ecology

The Chimney Rock South Rangeland Reference Area has been represented by two similar plant community types since it was established in 1973. When the site was first established the inside and outside transects were represented by the Parry oatgrass-Rough fescue-dominated community type. When grazing pressure was reduced on the site and the site was protected from grazing the plant community succeeded to a Rough fescue-Parry oatgrass (Group 1)-dominated community on the outside transect and a Rough fescue (Group 2)-dominated community on the inside transect. Moss and Campbell (1947) and Willoughby (1992) found that rough fescue grows almost to the exclusion of other plants in the absence of disturbance and that rough fescue declined and Parry oatgrass increased with increased grazing pressure. Moss and Campbell (1947) felt that the rough fescue-Parry oatgrass-dominated community represented a grazing disclimax. It would appear that the heavy grazing pressure on the site prior to 1973 caused rough fescue to decline and allowed Parry oatgrass and sedge to increase. Protection from grazing and reduction in grazing pressure since 1973 has allowed rough fescue to recover on both transects.

The successional sequences for the Chimney Rock South Rangeland Reference Area are outlined in Figure 4. Heavy grazing pressure caused the rough fescue-dominated community type to succeed to a Parry oatgrass-dominated type. Protection from grazing and a reduction in stocking rate allowed the community to succeed back to a rough fescue dominated community. However, since 1986 the cover of fireweed has increased on the inside ungrazed transect and the species richness and diversity of the outside grazed transect is consistently greater when the same years are compared. This is consistent with other studies, Willoughby (1992) found that the species diversity of a rough fescue-Parry oatgrass-dominated plant community declined when protected from grazing for more than 20 years. Leach and Givnish (1996), found a 8 to 60% drop in species richness over a 32 to 52 year period in undisturbed prairie fragments of Wisconsin. Bailey et al. (1987), found that rough fescue tiller density, production and frequency decreased and there was an invasion of tall growing forb species and weeds when protected from grazing over 12 years in the Aspen Parkland. In South Africa Tainton (1981) has found that some veld species become moribund and die if left ungrazed or unburned for a number of years. Presently, undecomposed grass swards on the ungrazed transect are approximately 15 cm thick. Between this litter layer and the soil surface is a 3 cm organic mat consisting of slightly to moderately decomposed grass. This extensive litter layer has promoted a cool humid soil environment which has allowed the ungrazed inside transect to succeed to a rough fescue-fireweed dominated community type. This illustrates a loss in species diversity and an invasion of tall growing forbs.

### Range condition

Traditionally, range condition has been defined by comparing the species present on a site with species of the climax community (Dyksterhuis 1949, Wroe et al. 1988). This climax





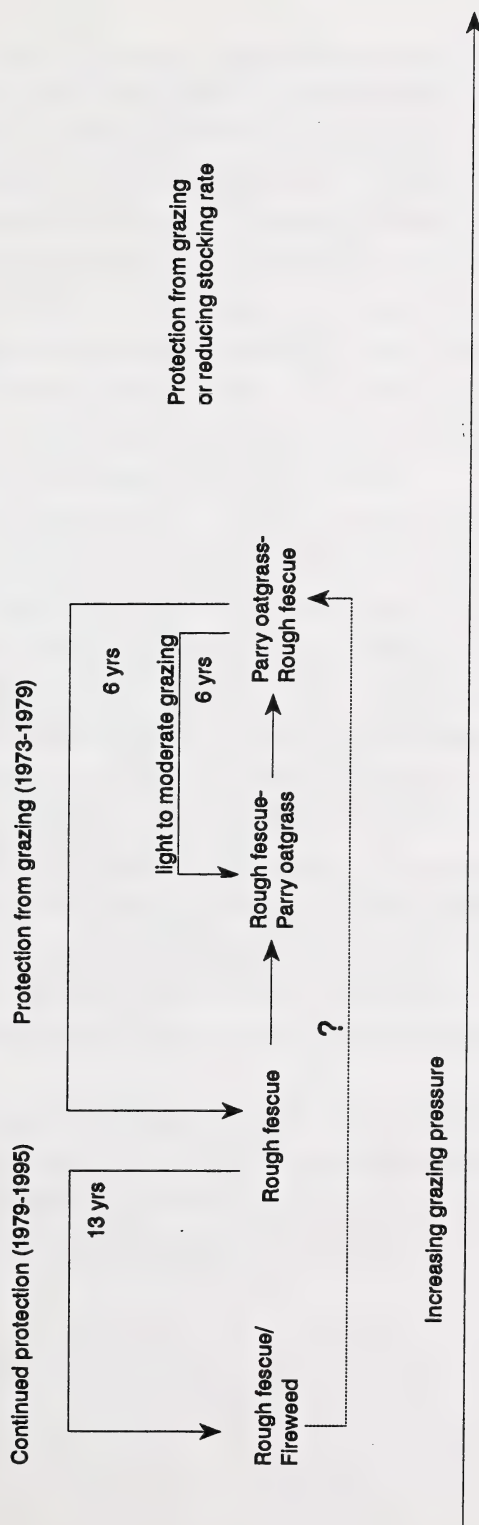


Figure 4. Successional changes in the presence and absence of grazing disturbance at the Chimney Rock South rangeland reference area.



range condition model suggests that changes in vegetation will be directional, predictable and revert back to the original rough fescue-dominated predisturbance plant community in time. It would appear that this model of rangeland succession would appropriately describe the successional changes at the Chimney Rock South rangeland reference area up to the point in time before fireweed became a significant component of the ungrazed transect. Moderate to heavy grazing pressure caused rough fescue to decline and allowed Parry oatgrass to increase in cover. Protection or reduced grazing pressure allowed the plant community to succeed back to a rough fescue-dominated community type.

However, continued protection from grazing has allowed the plant community to succeed to a rough fescue-fireweed dominated community type. This community is less diverse and less vigorous than the grazed outside transect. This makes it extremely difficult to assess rangeland condition using the traditional climax range condition concept (Wroe et al. 1988). Blackmore (1983), felt that data from exclosures with excessive litter accumulations must be judged and interpreted before range condition could be determined.

The current dilemma on how to describe range condition under these successional sequences has led the Task Group on Unity in Concepts and Terminology (1995) to propose that ecological site and desired plant community concepts be used to assess the status of rangelands. Ecological site is defined as "a kind of land with specific physical characteristics which differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation in its response to management". The grazed transect at the Chimney Rock South reference area has succeeded to a community that is dominated by rough fescue and Parry oatgrass. This community type has been quite stable for the last 16 years (Table 2) and appears to be healthy and have a good diversity of grasses and forbs. In contrast the ungrazed transect has succeeded to a community that is dominated by rough fescue and tall forb species. This community is not as diverse and does not appear to be as vigorous.

The desired plant community is defined as "of the several plant communities that may occupy a site, the one that has been identified through a management plan to best meet the plan's objectives for the site". The desired use of this plant community is for wildlife and livestock production, continued grazing by domestic livestock at the present level of use is required to maintain the most productive plant community. If there is some other resource that is valued that requires succession to a rough fescue-tall forb dominated community then the site should be left undisturbed.

Historically, these grassland communities in the foothills of Southwestern Alberta have been burned and grazed by wild and domestic ungulates. It is unlikely that this community would naturally succeed to a Rough fescue-Tall forb-dominated community type because the undisturbed condition of this grassland is not natural. Currently, the primary resource value for these rangelands is recreation, wildlife and livestock production. Periodic burning and/or grazing by wildlife and livestock will be needed to maintain these resource values.





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**SPECIES COMPOSITION OF THE INSIDE AND OUTSIDE  
CLUSTER GROUPS OUTLINED IN  
FIGURE 3**



## RESOURCE INVENTORY, EDMONTON ALBERTA

Group name: Group I 73-95 out, 73 in

		Plots															
		Avg	Avg	CS730	CS731	CS790	CS810	CS830	CS860	CS890	CS920	CS950					
		% P	MC	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
LAYER	SPECIES																
5	POTEFRU	66.7	00.8			01					02	01			00		
	VACCACAE	33.3	03.6	04							26	01					
	ROSAACI	33.3	00.8					01			04						
	ROSAARK	22.2	00.2													01	
	SALICOM	11.1	00.2														
	FRAGVIR	0100	08.6	01													
	ACHIMTL	0100	02.9	02	05	03		06	10	25	12	08					
	PENSCON	88.9	07.5	02	02	03		01	02	05	02	04					
	GEUMTRI	88.9	04.1	04	02		04	05	01	33	10	08					
	GALIBOR	88.9	01.8	02	05	03		00	03	05	09	06	05				
	THALVEN	77.8	01.5		01	00	00	00	01	00	00	01	01				
	ANEMMUL	66.7	01.9			02		00	01	02	06	01	02				
	ASTELAE	66.7	01.1		03		00	00	01	03	00	00	01				
	EPTLANG	55.6	01.2				00	02		12	03	01					
	POTEGRA	44.4	02.1					02	02	12	01						
	ANTELAN	44.4	00.5					00	00		01						
7	MYOSALP	33.3	03.1								01				01		
	ANTEPAR	33.3	00.7	01							01				26		
	LUPIER	22.2	00.5	02	02										02		
	HEURIC	22.2	00.1			00						00					
	SOLISPA	11.1	00.7									06					
	ANEMPAT	11.1	00.7														
	HEUCCYL	11.1	00.2														
	HACKFLO	11.1	00.1						00						01		
	CERAARV	11.1	00.1							00							
	SOLIMUL	11.1	00.1							00						00	
	ALLICER	11.1	00.1													00	
	CAMPROT	11.1	00.0													00	
	RANUCAR	11.1	00.0													00	
	SISYMON	11.1	00.0													00	
	DODECON	11.1	00.0													00	
	TARAOFF	11.1	00.0													00	
VIOLADU	11.1	00.0													00		
7	FESTSCA	0100	14.3	03	05	16	01						00				
	DANTPAR	0100	12.2	16	17	12	02	03	04	37	39	14					
	AGROTHA	88.9	02.2	02	02	04	00	00	06	30	11	09					
	JUNCBAL	77.8	01.4	02	02	01		00	00								
	CAREOBT	66.7	06.6	12	11				01	16	02	02					
	FESTIDA	66.7	02.3		03		00	03	00	03	06						
	KOELMAC	66.7	01.3	02	02		00		01	03							
																	01

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**RESOURCE INVENTORY, EDMONTON ALBERTA**

Group name: Group I 73-95 out, 73 in

[illegible]



VEGETATION REPORT  
 RESOURCE INVENTORY, EDMONTON ALBERTA

Group name: Group II 79-95 in

Plots																
		Avg	Avg	CS79I	CS81I	CS83I	CS86I	CS89I	CS92I	CS95I						
LAYER	N	SPECIES	% P	MC	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
5	1	ROSAACI	42.9	04.4					19							
	2	POTERFU	42.9	00.5	01		00								01	
	3	ROSAARK	28.6	00.7							02				01	
	4	ROSAWOO	14.3	00.8		05										
	5	ZIZIAPT	14.3	00.0												
6	6	EPILANG	85.7	10.7												
	7	PENSCON	85.7	04.9		03		02		08		29		23	08	
	8	GERAVIS	85.7	03.0	02	05		01		03		16		08	02	
	9	ACHIMIL	85.7	02.2		00		00		03		08		01	00	
	10	GALIBOR	71.4	00.7	02	00		00		02		09		00	01	
	11	POTEGRA	57.1	00.3		01		00		00		01		00	00	
	12	THALVEN	42.9	00.3				00								
	13	ANEMMUL	42.9	00.2		00		00		01						
	14	FRAGVIR	28.6	00.6		03		01								
	15	HEUCRIC	28.6	00.2		00				01						
	16	MYOSALP	28.6	00.2									00		00	
	17	CAMPROT	28.6	00.1												
	18	ASTELAE	28.6	00.0		00						00			00	
	19	LUPIARG	14.3	00.3	01											
	20	MONAFIS	14.3	00.2												
	21	HEUCCYL	14.3	00.2												
	22	GEUMTRI	14.3	00.1		00					01				01	
	23	GEUMMAC	14.3	00.1												
	24	ALLICER	14.3	00.1												
	25	CERAARV	14.3	00.0												
	26	POTEDIV	14.3	00.0												
	27	SOLIMIS	14.3	00.0												
	28	BOTRLUN	14.3	00.0												
	29	VICIANE	14.3	00.0												
	7	30	FESTSCA	0100	24.9	21	04		07		11		57		56	15
	31	DANTPAR	0100	04.6	03	01		02		06		15		01	02	
	32	AGROTRA	0100	02.0	02	00		00		00		02		04	02	
	33	FESTIDA	85.7	02.6	02	00				01		06		04	04	
	34	CAREOBT	57.1	08.5						02		35		09	12	
	35	JUNCBAL	57.1	00.9	02					00		02			00	
	36	FESTOVI	42.9	00.7	01	02		00								
	37	BROMPUM	42.9	00.4						00				02		00
	38	BROMCIL	28.6	00.4	01			01								
	39	AGRODAS	28.6	00.1							00		00			
	40	PHLEPPA	14.3	00.4	02											

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RESOURCE INVENTORY, EDMONTON ALBERTA

Group name: Group II 79-95 in

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Appendix 2. Range use in the Chimney Rock Allotment-Distribution unit #3 (D.U.3).

Year	AUMs	Percentage Use of Carrying Capacity	Season of Use
1947	2340*	185*	June 1-Oct 31
1948	2340*	185*	"
1949	2340*	185*	"
1950	2340*	185*	"
1951	1337*	106*	"
1952	1324*	105*	"
1953	1274*	101*	"
1954	1736*	137*	"
1955	1567*	124*	"
1956	1700*	134*	"
1957	1751*	138*	"
1958	1724*	136*	"
1959	1697*	110*	"
1960	1479*	122*	June 17-Oct 31
1961	1237*	117*	June 21-Oct 29
1962	1327*	105*	June 21-Oct 31
1963	225	147	June 24-Nov 10
1964	136	89	July 1-Oct 31
1965	154	101	Sept 30-Oct 21
1967	213	139	Sept 21-Oct 31
1966	267	175	July 2-Aug. 30
1968	166	108	July 3-Aug. 1
1969	167	109	July 1-Aug. 5
1970	158	103	July 1-July 31
1971	160	105	July 2-July 30
1972	156	102	July 1-Sept 1
1973	124	81	July 1-Aug. 31
1974	125	82	July 1-Sept 1
1975	153	100	July 1-Aug. 31
1976	153	100	June 29-Sept 1
1977	152	99	June 1-Sept 1
1978	154	101	June 29-Sept 1
1979	154	101	July 1-Sept 1
1980	152	99	"
1981	152	99	July 1-Aug. 31
1982	152	99	"
1983	152	99	"



1984	152	99	"
1985	152	99	July 1-Sept 30
1986	203	133	July 15-Sept 23
1987	61	39	July 15-Sept 30
1988	194	127	"
1989	258	69	"
1990	153	100	July 25-Sept 23
1991	155	102	July 15-Sept 30
1992	164	107	"
1993	99	65	"
1994	145	95	"
1995	153	100	"
Average		111	

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Carrying capacity for the Chimney Rock allotment (1264 (1978)) and for the D.U. #3 (153 AUMs (1978)) based on 50% of grass production.

\*Indicates percentage use was calculated from the total AUMs utilizing the allotment.

Note - Percentage use of carrying capacity is determined by dividing actual use by calculated carrying capacity







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